



## THE EFFECT OF PESTICIDES ON REPRODUCTION POTENTIAL OF THE EARTHWORMS: A REVIEW

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### ABSTRACT

The impacts of pesticides (insecticides, molluscicides, bactericides, fungicides, nematocides etc) were investigated on an earthworm population reproduction potential. Modern agriculture field totally depend the inorganic fertilizers and pesticides for their queue amount of yield. More than 99 % of applied pesticides have the potential to affect non-target organisms and become widely dispersed in the vicinity as potential contaminants. Due to this soil organisms are totally affected. Earthworms are called as farmer's friend. They also affected by excess usage of inorganic fertilizers and pesticides. Pesticides have the effect on reproduction potential of earthworms so automatically the population of the worms decline. This review explains the impact of pesticides on reproduction potential of earthworms.

### INTRODUCTION

Our nation father Gandhi already told agriculture is a backbone of India. Today agriculture totally depend the chemical fertilizers and pesticides. India is the largest manufacturer of pesticides. More than 128 pesticides are registered in India [1]. Pesticides which include insecticides, molluscicides, bactericides, fungicides, nematocides, etc [2].

Farmers are applying several kinds of pesticides to get rid of pests. Tons of synthetic pesticides and fertilizers are applied annually to crops worldwide. Whereas pesticides are used for precise purposes, to eliminate weeds, kill fungus and eradicate insects all of which can damage crops chemicals can move off site and create non-target organisms. A small share of pesticides applied on a given field or in a given area actually reaches the intended target. It is estimated that less than 0.1 % of the pesticides applied to crops reach the target pests [3]. Thus, more than 99 % of applied pesticides have the potential to impact on-target organisms and become widely

dispersed in the environment as potential contaminants. These uncontrolled and continuous malpractices result in the accumulation of insecticide in the soil.

Earthworms are a major soil fauna on soil ecosystem, constituting 80 % of the soil invertebrate population in many ecosystems, especially in the tropical ecosystems. There are about 3920 named species of earthworm so far reported worldwide. In India, so far, 509 species, referable to 67 genera and 10 families, have been reported. Earthworms are ecologically important soil organisms and toxic effects on their gametes should correspond directly to their populations and indirectly, to other wildlife. Chemicals behave as pollutants when viewed for the ecosystem, environment and non-target organisms [4]. They play a very important role in soil fertility and are a major food source for many species such as other invertebrates, amphibians, reptiles, birds and mammals. Due to this we can know the earthworm is affected the total food chain and food web corrupted.

Earthworms are naturally in contact with the solid and aqueous soil phases and so directly exposed to pesticides, insecticides and chemical fertilizers thus it is interesting to use them to estimate pesticide effects.

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Pesticides at high doses may be lethal to both laboratory animals and human beings, causing severe illness at sub lethal levels. Pesticides are known to produce morphological, anatomical and physiological changes in the reproductive aspects of different non-target animals, such as earthworms.

Since vermicompost and vermiwash (earthworm body fluid) can be easily mass produced by the farmers which already find a place in organic farming, it is necessary to assess their effects on plant growth parameters and insect-pest activity, which could help in formulating management strategies with more options. In this review we simply discussed the impact of pesticide on earthworm reproduction potential.

### Impact of pesticides on earthworm reproduction parameters

Numerous reproductive parameters have been studied in earthworms exposed to various insecticides and chemicals: cocoon production, cocoon hatching and sperms production, viability of the worms produced, sexual maturation and generotoxicity [5]. However, earthworm biomass and cocoon production rate can acts useful biomarkers to measures the efficiency of earthworm in vermiculture operations.

### Role of Food on reproduction potential

Spurgeon *et al* [6] reported that cocoon production rates were low due to the lack of suitable food materials in the artificial soil. Fayolle *et al* [7] explained the feeding source played an important role in cocoon production patterns in *Dendrobaena veneta*. Basically, reproduction potential (cocoon production) behavior of earthworm could be interpreted with the chemical, physical and biological properties of waste material.

It is well understand that the quality and amount of food material influences not only the size of population but also the species present and their rate of growth and cocoon production [8-10].

### Effect of Insecticides

When *Eisenia fetida* treated with malathion, it decreased spermatic viability in spermathica [11]. Insecticides are proved to be toxic impact to earthworms by various workers [12, 13]. They have been used assess impact of soil pollution [14]. The lab toxicity of insecticides on various species of earthworm has been investigated [15].

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Garcia and Fragoso [16] reported that the presence of some growth retarding substances in waste material is also important to determine the earthworms cocoon producing efficiency. The reproductive system is sensitive to environment lead (Pb) affects the fertility of earthworms, eg: *Eisenia fetida* [17, 18], *Eudrilus eugeniae*, *Perionyx excavatus* and *Eisenia andrei* [19].

Radha and Krishnamurthy [20] in *P. corethurus*, Sagar [21] in *P. viridis* and Kulkarni [22], in *L. mauritii* studied the Ache activity with the effect of different pesticides and noted significantly decreased enzymatic activity, which in turn affect the process of gametogenesis as regulated by the gonadotropic hormones in the brain of annelids.

Dayananda *et al* [23] studied the effect of sub lethal concentration of sumithion (Fenitrothion) on carbohydrate metabolism of south India earthworms *L. mauritii*. Fischer Erno [24] reported decrease to totally prevented cocoon production in *Eisenia fetida* with the effect of atrozine and paraquatherbicides.

Lakhani *et al* [25] in *Eudichogaster kinnerai* when treated with monocrotophos for twenty days, Lakhani [26] and Lakhani [27] also found many empty spaces in ooplasm, *Eudichogaster kinneari* when treated with rogor for twenty days. Long term exposure to metals and organochlorine pesticides has been reported to affect cocoon production and hatching success [28, 29] and Pb was found to influence on the spermatozoa of *E. fetida* [30] and cocoon viability.

The decrease of the sperm count at 15 and 30 days at dose of 600 mg malathion for kg of soil possibly indicates that the insecticides has been degraded to its active metabolites malaaxon and isomalathion, which could also alter spermatogenesis [31].

Govindarajan and Prabakaran studied the monocrotophos insecticide effect on reproduction potential of earthworms. Similar result was reported under heavy metal bioaccumulation by *Lampito mauritii* and *Eisenia fetida*. The first cocoon appeared after 30 days.

### CONCLUSION

It can be concluded that better results of biomass as well as reproduction potential of composting earthworm species could be interpreted with the physico-chemical, palatability and microbiological composition of their feeding or substrate materials.



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